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Schools IAQ Update: Getting Ready for Fall 2022 and Beyond

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Working with Schools to meet the EPA Clean Air in Buildings Challenge

Use CDC and SED Guidance to meet school IAQ goals

- Schools and Districts have the authority to decide how to implement the Guidance
- Consider the local conditions, program needs, funding opportunities

IAQ is a key factor in infection control and improved learning

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Agenda

- Building IAQ and Classroom Ventilation
- Why, Where, When, How of Air Cleaners
- Recent Science and Case Studies
  - CDC study, MMWR 2021
  - New York City
  - Erie County
  - NYSDOH BTSA study, 2018
- Preview of School IAQ Assessment and Rating Tool
- School Funding opportunities
- School Environmental Health Program
  - NYS School Environmental Health Program – IAQ Assessment
  - 9 Focus Areas of School Environmental Health
- Summary and Q & A

Summary of IAQ and Building Ventilation

See also NYSACHO 8/17/2021

Improve Ventilation

Minimum standards must be met

- Openable windows should be 4% of classroom floor area
  - 30 ft. x 30 ft. x 4% = 36 sq. ft. of openable windows
- Mechanical ventilation should supply 300 to 450 cfm of outdoor air for a typical classroom
  - Assembly spaces, shops and labs normally require more outdoor air

Consult your school's Engineer/Architect or NYSED Facilities Planning about improving ventilation

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Improve Air Filtration

- Large Central Air Handling systems may accept high efficiency filters but should be designed by an engineer to maintain the same ventilation airflow.
- Higher efficiency filters may not be practical for smaller units, such as classroom unit ventilators, and may reduce the ventilation outside air – a significant negative.

Improve Air Filtration

CDC and ASHRAE:

"Aim to achieve filtration… similar to a MERV 13 filter…"

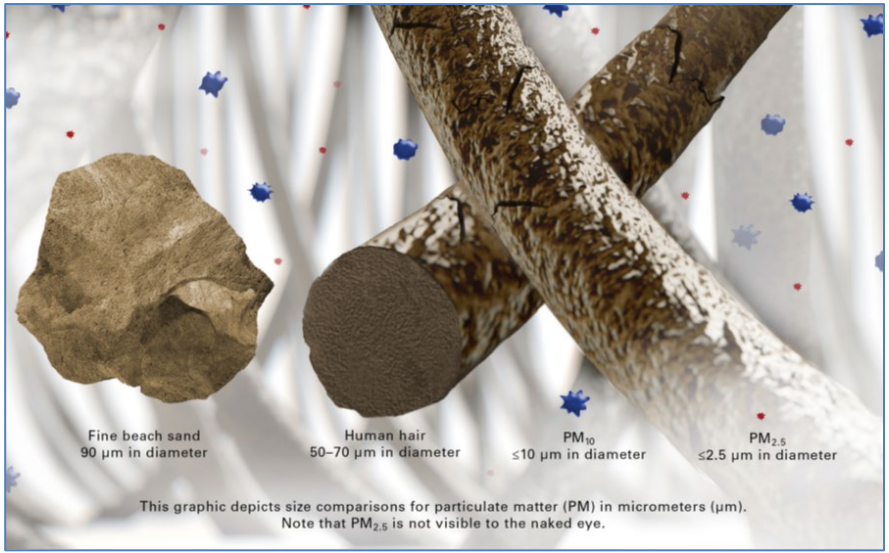
MERV 13 filter removes:

>90% of particles 3.0-10.0 µm

>85% of particles 1.0-3.0 µm

>50% of particles 0.3-1.0 µm

- https://www.ashrae.org/technical-resources/filtration-disinfection#mechanical



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Ventilation Summary

- Where possible, promote cross ventilation by opening windows and doors to increase air flow
- Consider using portable air cleaners in rooms that have minimum fresh air supply and in other rooms where ventilation is limited due to cold weather
- Consider using fans to cross ventilate rooms
- Prepare for colder months, when windows are closed


Open windows increase airflow
WASH HANDS
HEPA
Consider placement Portable air cleaners in non-ventilated rooms

Use of Portable Air Cleaners in Schools

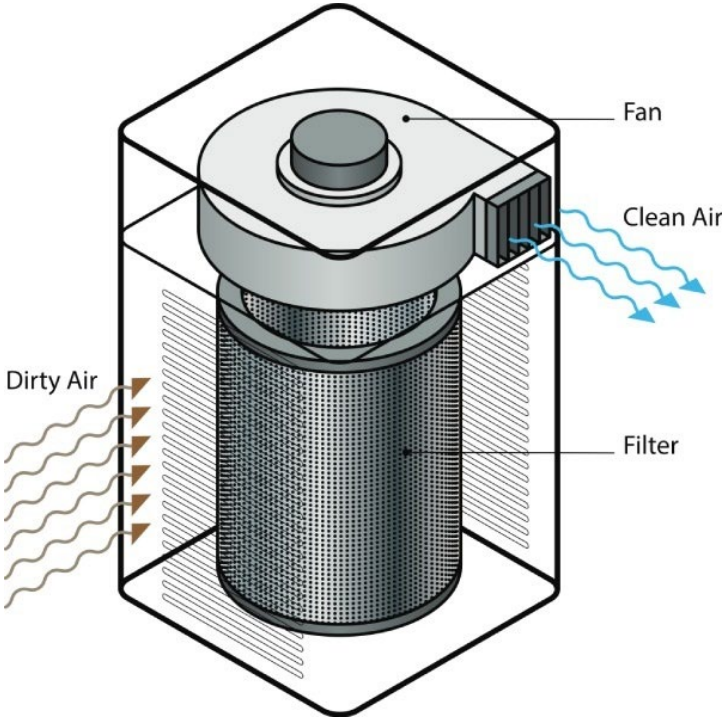
Why focus on air cleaners?

- Health benefits beyond COVID
  - Flu, colds, asthma
  - Particle removal – dust, mold
- Can be installed and operated as needed
- Can be placed and relocated easily
- Cost-effective and available for Fall 2022

How to select them for your school?

Parts of an Air Cleaner

- **Fan** – moves air in and out of the appliance
- **Intake** – dirty air enters the appliance
- **Exhaust** – clean air exits the appliance
- **Filter** – different types to remove air contamination



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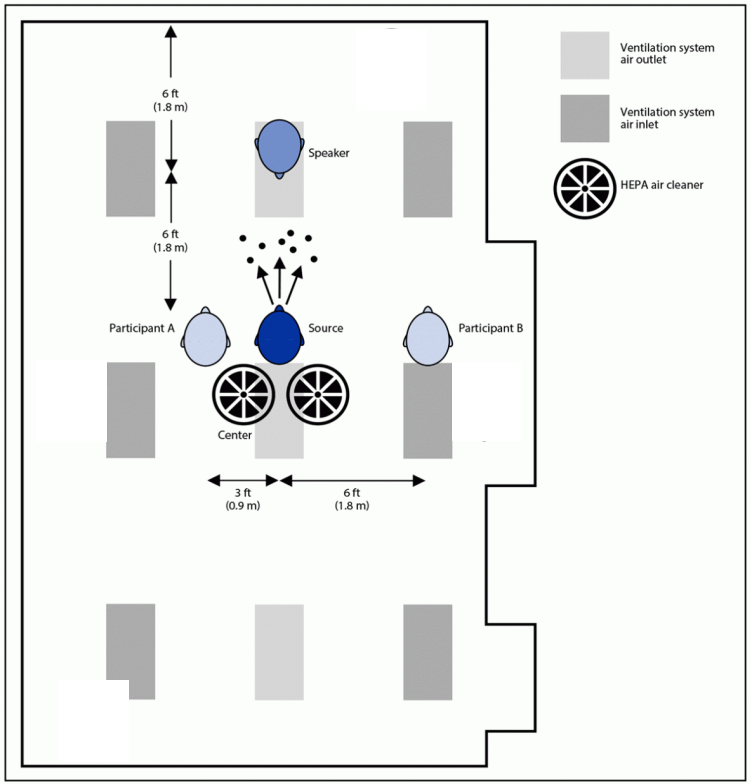
Air Cleaning

- Air contains dust, chemicals, biological fragments, and [infectious] microbes
  - People are a major source of air contamination – the more crowded the room the greater the need for filtration
- Air cleaners generally perform one (or more) function:
  - Filtration
  - Decomposition or Destruction
  - Inactivation or Sterilization
- DOH recommends HEPA/MERV-13 units to filter the air

CDC 2021: Portable HEPA Air Cleaners are Comparable to Universal Masking



Mask status	No Air Cleaner	Two Air Cleaners
No Masks		
Mean Aerosol Concentration	100.0	**35.3**
Universal Masks		
Mean Aerosol Concentration	**28.5**	9.6

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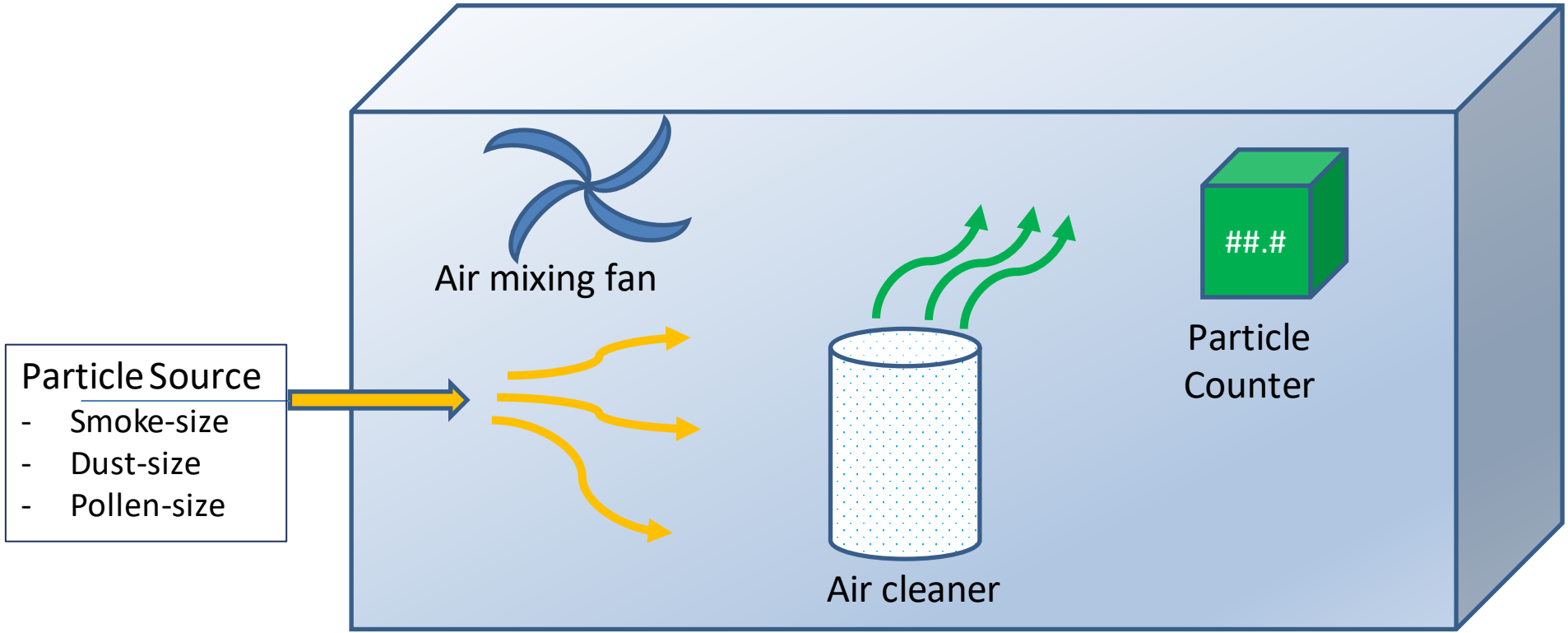
http://dx.doi.org/10.15585/mmwr.mm7027e1

Clean Air Delivery Rate (CADR)



Reading the CADR label

Suggested Room Area

Clean Air Delivery Rate in CFM for Smoke, Dust, Pollen

- Select air cleaners so that you have higher CADR than your room air supply rate (>300-450 cfm)
- If you use multiple air cleaners, the total CADR is the sum of the air cleaners
- CADR is typically measured at the air cleaner's highest speed, which may be too noisy for classrooms

https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home
This is an example of a label from a portable air cleaner

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Biological Inactivation or Sterilization

- Ultraviolet Germicidal Irradiation (UVGI)
  - Used in clinical settings to prevent TB spread
  - UV has been shown to affect viruses, bacteria and humans
- What are the health risks and safety standards?
- What amount of UV is needed? – "Fluence" – UV dose
- What kind of UV light – UVA, UVB, UVC, far-UV?
  - No official labeling system for identifying lights
- How long does it take to sterilize different bioaerosols?
    - FDA – '4 log reduction' for air purifiers
- How much of the treated air is exhausted versus recirculated?

Not recommended by DOH/SED for schools

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Destruction and Decomposition

- Ionizers, ozone generators, photocatalytic oxidation, dry hydrogen peroxide, hydroxyl generators, etc.
- Chemical and Physical processes to form products in air
  - What is produced and how do the products affect humans, mold, bacteria, viruses?
  - What are the other chemical reactions that it causes in indoor air?
  - How long does it take versus how fast is the room air change rate?
  - How much of the treated air is filtered, exhausted and recirculated?
- No industry standards or oversight

Not recommended by DOH/SED for schools

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Filtration by Electrostatic Precipitation (ESP)

- Air passes between electrodes and the particles are attracted to the 'collecting plates'
- ESPs may produce ozone – look for UL867 label and CARB certification
  - Poor maintenance may cause ozone production over time

Use with caution and follow manufacturer's operation and maintenance instructions

Statement Regarding Ionizing Air Cleaners. December 14, 2021

SED, in consultation with the Department of Health,

"We ask that you please refrain from applying ionization technology until further independent studies show that a particular manufacturer's product will not generate harmful byproducts. We recommend installing high efficiency air filters (MERV 13 or better), and/or increasing ventilation, as a proven and safe method for removing pathogens and other contaminants with the HVAC system."

- https://www.p12.nysed.gov/facplan/documents/StatementRegardingIonizationAirCleaners12.14.21.pdf

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Changes in IAQ Caused By Corona Discharge Air Cleaner

- Bureau of Toxic Substance Assessment with NYSED
  - Classroom study 2012-2013
- Air cleaner appliance formed ozone
- Ozone reacted with a VOC (lemon scent)
  - Ultrafine particles formed
  - Formaldehyde formed
  - Consistent with known air chemistry and physics
- Published in ASHRAE Journal December 2018

Other Technologies

Foggers, disinfectants, air fresheners, nano-treated surfaces, etc.

- "FDA does not intend to object to the distribution and use"
- "FTC is tracking complaint data related to coronavirus and taking actions against scammers…"
- EPA testing is limited and resource intensive

NYSDOH will review the scientific evidence on a case-by-case basis

NYSDOH will not comment on specific appliances or manufacturers

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Case Studies of Portable Air Cleaners in Schools

NYC Air Cleaners in Schools

- First priority was to ensure adequate ventilation per CDC guidelines. Air purifiers were provided as a supplement to normal ventilation
- Initial plan was to use air purifiers in 'at-risk' spaces (nurses' stations) but rapidly changed to all occupied rooms
- NYC spent $85,000,000 to install air purifiers in 62,000 rooms
  - Two air cleaners in each classroom provides ~2.4 ACH
- They surveyed over 30 different types of units before selecting hybrid technology (air filters and electrostatic precipitators) with minimal ozone (UL and CARB compliant)
- NYCDoHMH study of COVID-19 in NYC schools found relatively low infection rates as students returned full-time to in-person class in Fall 2020
  - Pediatrics (2021) 147 (5): e2021050605. https://doi.org/10.1542/peds.2021-050605

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NYCDOE Ventilation Tracker

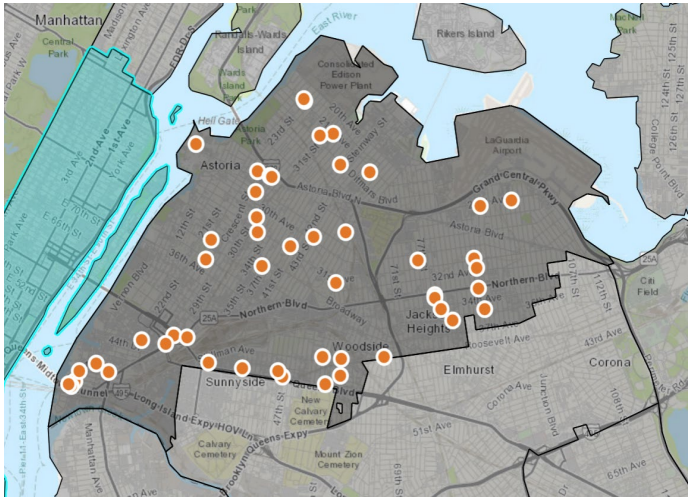
Total Rooms	Operational	Repair in Progress	No Mechanical Ventilation
98	71	0	27

98 Results

1 2 Next

EXPORT

Room #	Primary Use	Ventilation
101	Student Classroom	✓
101A	Bathroom	✓
102	Student Classroom	✓
102A	Bathroom	✓
102B	Closet/Storage Room	✓
103	Student Classroom	✓



- The NYCDOE Ventilation Tracker shows which classrooms have correctly operating ventilation systems
- Website is updated when reports are received from each school
  - https://schoolsearch.schools.nyc/

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Erie County Air Cleaners for Schools

- 10,600 air filtration units ordered for every K-12 classroom in Erie County
  - https://www2.erie.gov/health/index.php?q=press/erie-county-department-health-funds-air-filtration-equipment-k-12-schools-erie-county
- Erie County Department of Health has invested just under $5.3 million using CDC ELC COVID-19 Funding
  - https://www.cdc.gov/ncezid/dpei/elc/covid-response/index.html

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Erie County Air Cleaners

- Decided to place air cleaners only in classrooms
  - Some spaces (cafeteria, auditorium) are too large for portables
- Logistics of delivering large orders to schools – loading docks, interim storage
- Five-year life on HEPA filters – plan to begin purchasing replacements in year 4
- Discussions with University at Buffalo to perform air monitoring in schools but no plans for public 'dashboard'

Air Purifiers on a Limited Budget

- Prioritize placement where ventilation needs greatest
  - No HVAC
  - Greatest room occupancy or risk of infection
  - Least able to open doors/windows due to noise/safety
- Simplest designs (HEPA alone) may be most cost effective
- NYS DOH can help assess

Funding Opportunities NYS Education Dept

Overview of Funding Opportunities for Schools through NYSED

- ESSER Funding
- GEER Funding
- Capital Outlay Project Funding ($100K)
- Building Aid

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Elementary and Secondary School Emergency Relief (ESSER) Funds

There are several federal funding streams that have been provided to districts through NYSED in response to COVID 19. Indoor air quality improvements could be funded by these sources. Below are the timelines for the separate funds:

CARES (ESSER 1):	Funds awarded by May 2021
$1 billion	Funds must be obligated by September 30, 2022
CRSSA (ESSER 2):	Funds awarded January 2022
$4 billion	Funds must be obligated by September 30, 2023
ARP (ESSER 3):	Funds awarded December 2021
$9 billion	Funds must be obligated by September 30, 2024

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Elementary and Secondary School Emergency Relief (ESSER) Funds

- As you can see, all the money from these funds has been allocated.
- A school District will not be receiving additional funds and there are no outstanding recipients of funds at this point.
- However, Districts can submit an amendment to their application to reallocate funds that were awarded to them.
- The amendment for reallocation must show how the new use of the funds is consistent with the statuary purposes of the programs “to prevent, prepare for, and respond to” COVID-19.
- They must submit and get approval from the Office of ESSA Funded Programs prior to making the purchase.

Elementary and Secondary School Emergency Relief (ESSER) Funds

A-3. How may an LEA use ESSER funds?

- 17. School facility repairs and improvements to enable operation of schools to reduce risk of virus transmission and exposure to environmental health hazards, and to support student health needs.

- 18. Inspection, testing, maintenance, repair, replacement, and upgrade projects to improve the indoor air quality in school facilities, including mechanical and non-mechanical heating, ventilation, and air conditioning systems, filtering, purification and other air cleaning, fans, control systems, and window and door repair and replacement.

- 20. Other activities that are necessary to maintain the operation of and continuity of services in the LEA and continuing to employ existing staff of the LEA.

Elementary and Secondary School Emergency Relief (ESSER) Funds

B-4. May ESSER and GEER funds be used for personal protective equipment (PPE), cleaning and sanitizing materials, and related supplies necessary to maintain school operations during and after the COVID-19 pandemic?

Yes. Purchasing PPE, cleaning and sanitizing materials, portable air purifiers, and emergency supplies necessary to adequately respond to COVID-19 are allowable uses of ESSER and GEER funds. These costs are consistent with the statutory purposes of the programs "to prevent, prepare for, and respond to" COVID-19, and LEAs are specifically authorized to use funds for such activities.

Elementary and Secondary School Emergency Relief (ESSER) Funds

- Link to the NYSED page on ESSER funds: http://www.nysed.gov/federal-education-covid-response-funding/american-rescue-plan-elementary-and-secondary-school

- The Office of ESSA-Funded Programs can be reached:
  - 518-473-0295
  - conappta@nysed.gov
  - Reviews of budget amendments are dependent on if clarification is needed from the LEA. If no clarification is needed they can be approved in a day, if they do require clarification, it can take several days.

Elementary and Secondary School Emergency Relief (ESSER) Funds

- Reminder that all construction or renovation projects which require a permit must be submitted to NYSED's Office of Facilities Planning (OFP) for review and approval prior to posting bids for the work.
- Air purifiers do not require submission to OFP
- OFP has an expedited and separate review for ESSER funded work.
- OFP's website: https://www.p12.nysed.gov/facplan/
- Another great resource on using ESSER funds for construction, renovation, and remodeling: https://www.p12.nysed.gov/facplan/documents/CCSSOmemoonESSERfundsforconstructionDecember2021.pdf

Other Funds Through NYSED

- Governor's Emergency Education Relief (GEER) Funds
  - These funds are much smaller in dollar value, limited in use, and allocated already.
  - https://oese.ed.gov/files/2021/01/FINAL_-GEER_FactSheet_1.8.211.pdf
- Capital Outlay Projects ($100K)
  - Districts are permitted to do one Capital Outlay Project per year
  - Can be used for capital construction improvements but may not be used to purchase stand alone equipment such as portable air purifiers.
- Building Aid
  - Another potential avenue for construction / renovation related improvements but may not be used to purchase stand alone equipment such as portable air purifiers.
  - Districts commonly seek the assistance of an A/E firm and financial advisors to assist in managing Building Aid.

Outline of a Classroom IAQ Rating System

What is the IAQ in a Classroom?

Use a composite index of ventilation rate, particle filtration, and temperature control

- **A – exceeds standards**
- **B – meets standards**
- **C – needs improvement**

Dashboard reporting and transparency

Seasonal performance; Intra- and Inter-school comparisons; other environmental impacts

Tailor Existing Standards and Methods for IAQ Assessment

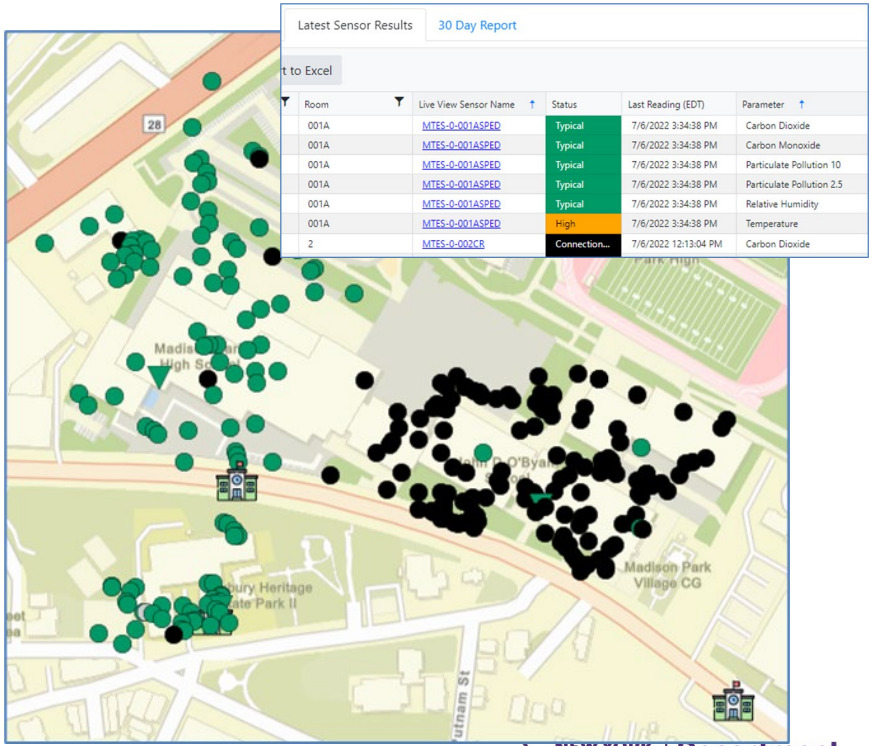
- **Checklists.** EPA Tools for Schools, NEMI Ventilation Verification and Energy Optimization Assessment
- **Standards.** ASHRAE Standards for Ventilation, Thermal Comfort; Uniform Code
- **Methods.** EPA, OSHA, ASTM, AIHA, Harvard School of Public Health

Outline of Steps

- Visual assessment – site walkthrough and evaluation of operations
- Ventilation measurement – rate of fresh air supply in ‘Air Changes per Hour’ (ACH)
- Filtration measurement – testing performed in rooms
- Temperature comfort – maybe seasonal approach?
- Data – acquisition, cleanup (formatting), reduction and calculations
- Reach out to SEHP if you’d like to get involved

Some Existing Models

- **NYCDOE** – School Building Ventilation Status
- **Boston Public Schools** – Air Quality and Air Exchange Testing Results
- **Los Angeles Unified School District** – Know Your Air Network
- **Vermont** – Explorations in School Indoor Air Quality



Example – Boston dashboard

School Environmental Health Program

Background

- Statewide school environmental health program
- Evidence based
- Development began in 2012
- Pilot tested in 10 schools
- Launching statewide

Steering Committee

- Integral to the success of the program
- Members include state and federal agencies, and a variety of non-governmental organizations (many representing school-related professions)
- >35 active members representing key organizations
- Provide feedback and guidance, help with outreach/ promote the program, and assist with implementation

Nine Focus Areas

- Indoor Air Quality (IAQ)
- Energy and Resource Conservation
- Integrated Pest Management (IPM)
- Mold/Moisture
- Chemical and Environmental Hazards
- Cleaning and Maintenance
- Transportation
- Construction/ Renovation
- Water Quality

CLEAN, GREEN, AND HEALTHY SCHOOL

APPLE
LEVEL 4

- Demonstrate success in all 9 Focus Areas
- Tell your story
- Host a Poster Day at your school
- Create and submit a plan to sustain success at your school

BLOSSOM
LEVEL 3

- Demonstrate success in 5 Focus Areas
- Take pictures and/or create graphics of the results of the completed Focus Areas

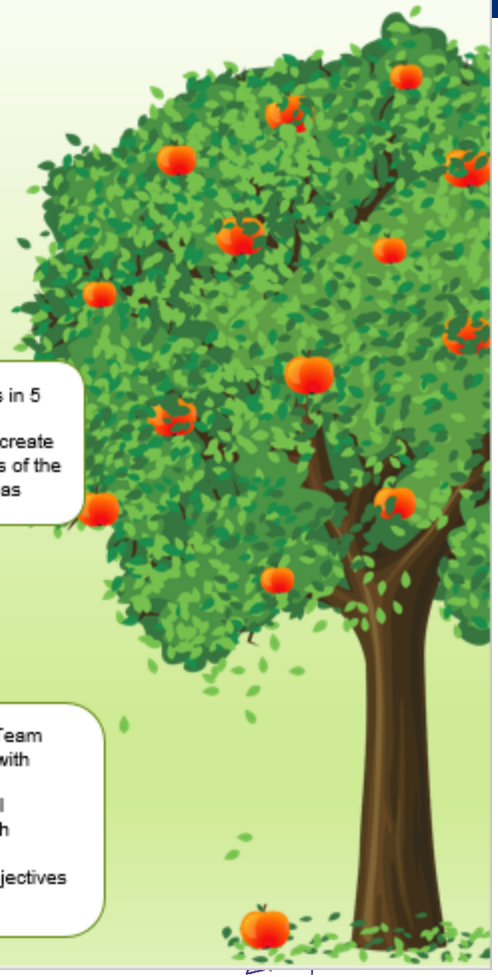
SPROUT
LEVEL 2

- Demonstrate success in the Indoor Air Quality Focus Area
- Tell the success story of completing this Focus Area

SEED
LEVEL1

- Designate a Green Team and submit a roster with required information
- Complete the School Environmental Health Assessment form
- Develop Goals & Objectives for your school

ENROLLMENT



Demonstrating Success in the Focus Areas

- Schools are required to submit various items
  - Checklists (EPA Tools for Schools)
  - Documents (School procedures or protocols)
  - Short descriptions (400 words or less)
  - Training certificates

K-12 Resources

SED COVID-19 Guidance

http://www.nysed.gov/coronavirus

http://www.nysed.gov/back-school/contact-us

CDC COVID-19 Guidance

www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-guidance.html

ASHRAE COVID-19: One Page Guidance Documents

https://www.ashrae.org/technical-resources/covid-19-one-page-guidance-documents

Websites to compare room air cleaners

Association of Home Appliance Manufacturers (AHAM): https://www.ahamdir.com/room-air-cleaners/

California Air Resources Board (CARB): https://ww2.arb.ca.gov/our-work/programs/air-cleaners-ozone-products/california-certified-air-cleaning-devices

NYS School Environmental Health Program *for Clean, Green, and Healthy Schools*

www.health.ny.gov/environmental/indoors/healthy_schools/

Key Contacts

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Thank You